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ABSTRACT

Eight activity packages, designed to teach students mathematical topics which are inappropriate to teach through a paper and pencil approach, are presented. The materials were created so that students: (1) can follow the instructions with little supervision; (2) are physically engaged in the activity, either measuring, counting, drawing pictures or graphs, gathering data, making charts, or doing constructions; (3) can complete the activity and clean up in approximately 40 minutes; (4) can demonstrate mastery of the topic through successful completion of the activities and questions in the package, rather than taking a posttest; and (5) can participate in the activity regardless of their level of competence in basic computation. The set of materials comes with an analysis of the topics covered and purposes, aims, and approach of each package. Individual package titles are: (1) Special Number Multiplication; (2) Multiplying Numbers by 10,000 and 1,000; (3) Reciprocals; (4) Finding Out About Ratio and Proportion; (5) Comparing Lengths Using Ratios; (6) Finding Squares; (7) Can You Make a Triangle Out of Any Three Line Segments; and (8) Algebra with Rods. (MP)

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ACTIVITY PACKAGES FOR USE IN JUNIOR HIGH SCHOOL MATH LABS

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PRODUCING ACTIVITY PACKAGES FOR THE MATH LAB

Report on the Summer Curriculum Writing Project
by Rita Bass and Karen Petersen

The project of writing activity packages for the Math Lab began with the following statement of purposes and goals:

"The purpose of the activity package is to introduce the Lab students to mathematical topics which are inappropriate to teach through a paper and pencil drill approach. The packages can be used to guide students to discover concepts through the activities or to present concrete models of concepts, operations or algorithms in order to give the students a greater chance to understand the abstractions that they deal with in Mathematics.

Many of the Lab students have motor-centered learning styles which do not lend themselves to the usual worksheet or textbook lesson. These packages are an attempt to meet the needs of such students. Many Lab students also have memory and perceptual problems. For these students the packages should provide pictorial images, student involvement and a developmental approach which will enable them to gain understanding and thus increase their retention of the material presented."

A great deal of commercial material is now available for Math Labs. In order to facilitate the work and to avoid duplication, Karen and I examined much of this material. Although most of it is very good, in almost all instances it is aimed at students in the primary grades. Our junior high school aged students are still in need of instruction on many of the topics that were covered by the commercial materials, but it was necessary for us to adjust the presentation to a level which was more suitable for the age of the students that we work with.

Our activity packages were written specifically so that they could be used in the East Ramapo Junior High School Math Labs. They were created so that the students:

1) can follow the instructions with little supervision.

2) are physically engaged in the activity, either measuring, counting, drawing pictures or graphs, gathering data, making charts or doing constructions.

3) can complete the activity and clean up in approximately 40 minutes.

4) can demonstrate mastery of the topic through successful completion of the activities and questions in the package, rather than taking a post-test.

5) can participate in the activity regardless of their level of competence in basic computation.

Eight activity packages were written in all. Since this was an experimental project, we decided to cover a number of topics and use a variety of formats. We hoped to find out if certain topics were more suitable for activity packages or if one approach was more successful than the others.

The following is an analysis of the topics covered and the purposes, aims and approach of each package.

SPECIAL NUMBER MULTIPLICATION was chosen as the remediation topic for whole number operations. In this package the student reviews multiplication by zero, one, five, eleven and twenty-five. Patterns and hints for remembering the products are presented as well as some drill and some discussion of the commutative property and the identity element for multiplication.

MULTIPLYING DECIMALS BY 10, 100 AND 1000 was written to be used as either a remediation unit or a discovery exercise, depending upon the students knowledge of decimals. In this unit the student is guided towards finding the rules for multiplying by these powers of ten through the use of the hand-held calculator. Our purpose was both to increase the students ability to multiply with decimal numbers and to provide a meaningful use for the calculator in the Math Lab.

RECIPROCALS was the topic selected for the remediation unit for fractions. In working in the Lab we found that many students were confused by this topic and there was little comprehensive textbook material available about reciprocals. The unit explains the meaning of reciprocal and then has the student find reciprocals for common fractions, whole numbers and mixed numbers. The students are also required to check to see if certain numbers are reciprocals, which emphasises the definition of reciprocal rather than just presenting a mechanical method of finding it.

Ratio and Proportion was another topic for which only limited amounts of textbook material was available in the Lab. For this reason we decided to write two units on ratio. In the first unit, FINDING OUT ABOUT RATIO AND PROPORTION, the student becomes familiar with the concepts of ratio and proportion by physically working with beans and chips and finding equivalent ratios. They also learn to write ratios using a colon and to find the missing number in a proportion intuitively. In the second unit, COMPARING LENGTHS USING RATIOS, ratios are used in conjunction with geometry and measuring, and word problems are presented which are translated into ratios.

Geometry is also explored in two other units. FINDING SQUARES presents the parts of a square, has the student identify squares in the environment, has the students work with patterns involving squares by making pentominos and drawing them on grid paper, and finally introduces the use of the unit square for determining area.

Triangles and the relation between the lengths of the sides are examined in CAN YOU MAKE A TRIANGLE OUT OF ANY THREE LINE SEGMENTS? In this unit the student uses cuisenaire rods to discover experimentally the relationship between the sum of the lengths of any two sides and the length of the third side. The designation of the lengths of the sides as a, b and c is also introduced.

ALGEBRA WITH RODS presents the solving of equation through the use of cuisenaire rods. The idea of a variable is introduced with the use of letters to represent the lengths of the rods. The vocabulary "equation","difference," and "sum" and the appropriate symbols are illustrated, and equivalent equations are written and solved using the rods. Although the topic is part of the eighth grade curriculum, the presentation is simple enough so that any student in the Lab should be able to use this package successfully.

Multiplication gives alot of people trouble, but multiplication is just a shortcut for counting and adding.

I'm Merlin Mathematician here to help you learn about....

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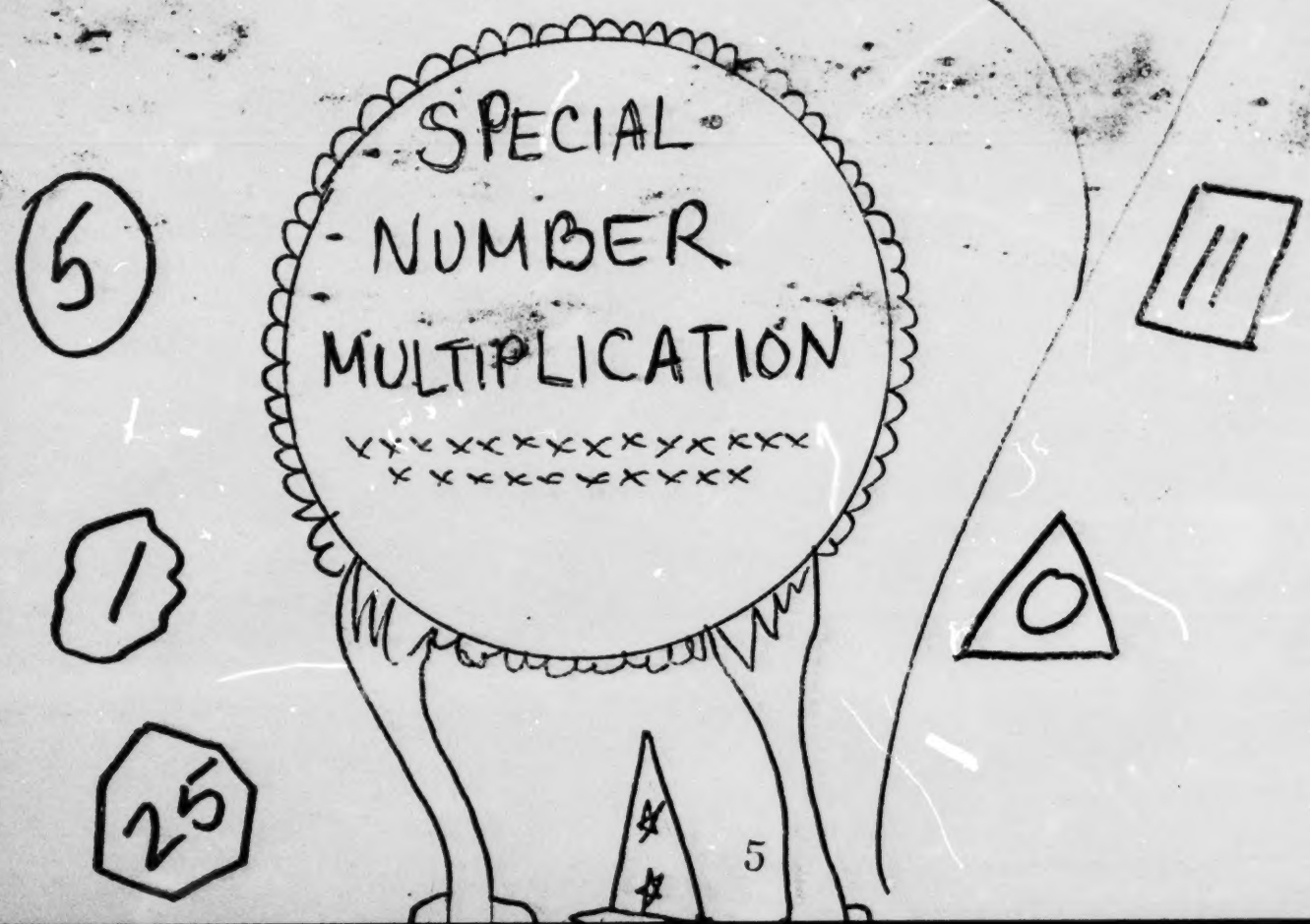
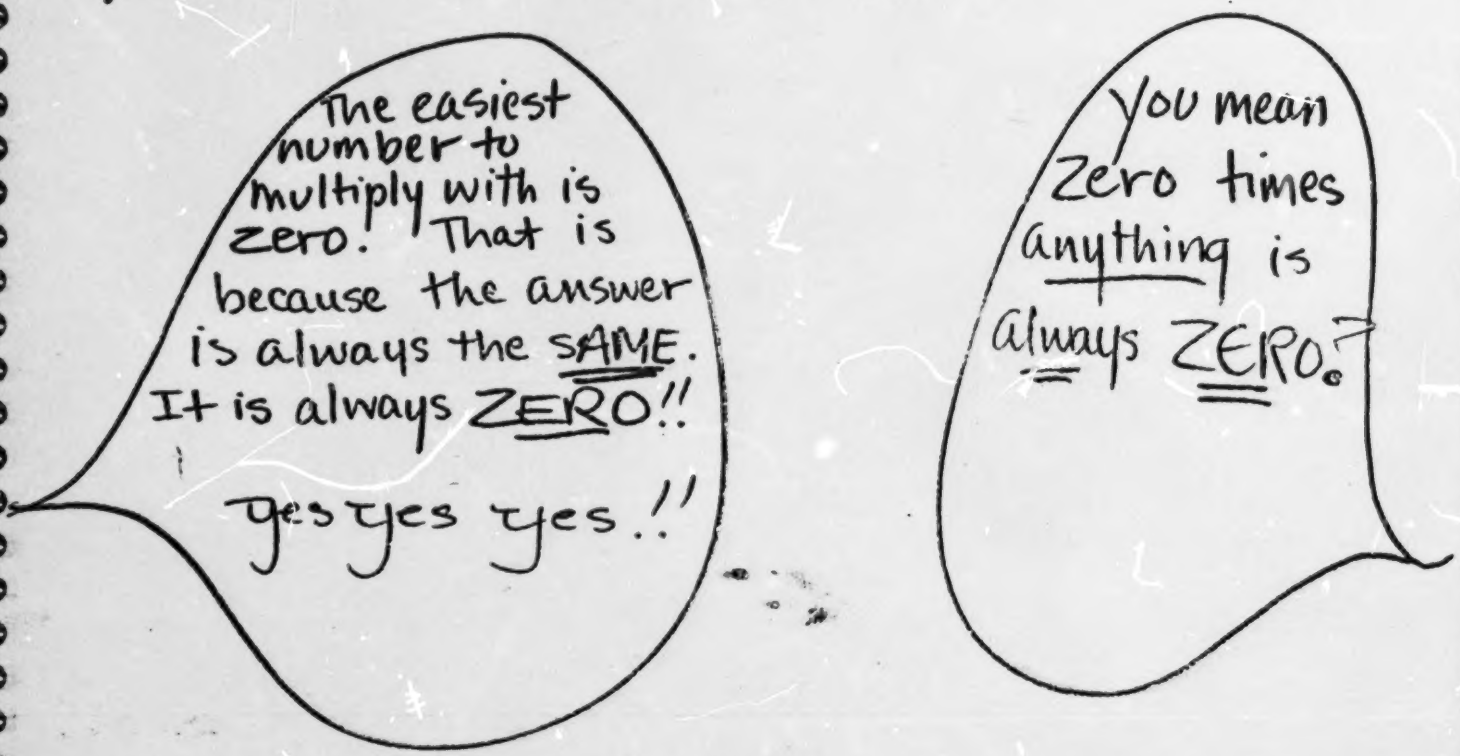


ZERO


The easiest number to multiply with is zero. That is because the answer is always the SAME. It is always ZERO!!
yes yes yes!!
You mean Zero times anything is always ZERO?

WRITE THE ZERO TIMES TABLE.

0 x 0 =
1 x 0 =
2 x 0 =
3 x 0 =
4 x 0 =
5 x 0 =
6 x 0 =
7 x 0 =

You've got the idea- Now some harder ones.....

2 x 0 =
6 x 0 =
10 x 0 =
11 x 0 =
27 x 0 =
48 x 0 =
64 x 0 =
204,623,789,724 x 0 =

Mathemeticians know another thing that makes MULTIPLICATION easy. You can change the order of the numbers you MULTIPLY and the answer will stay the same.

This is called the "COMMUTATIVE PROPERTY"

☆ Example ☆

these change Place

$5 \times 0 = 0$

so...

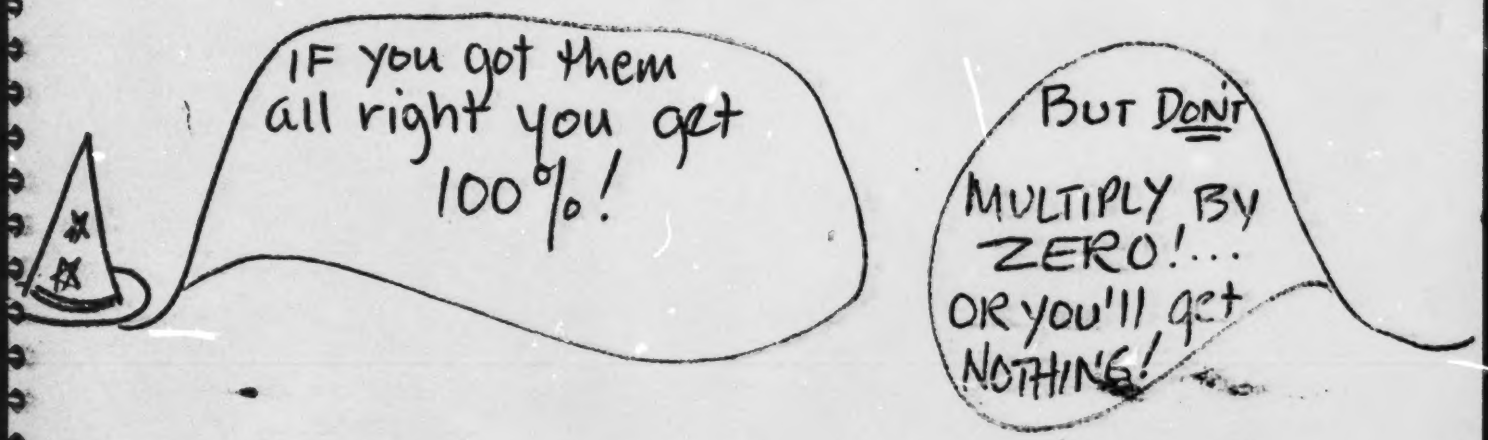
$0 \times 5 = 0$!

Use the COMMUTATIVE PROPERTY to do these:

0×8= 0×4= 0×1= 0×7=

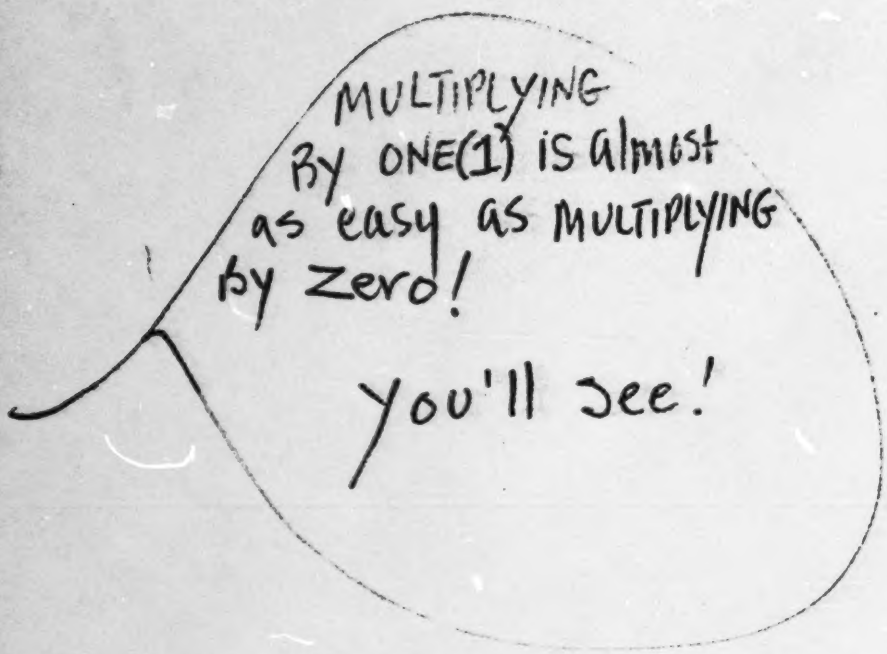
TRY THESE HARDER ONES:

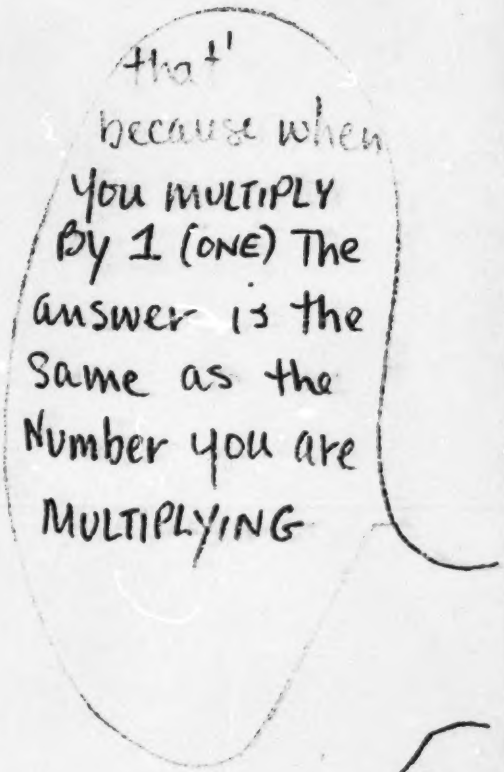
0×17= 0×25= 0×453= 0×126=



turn the page

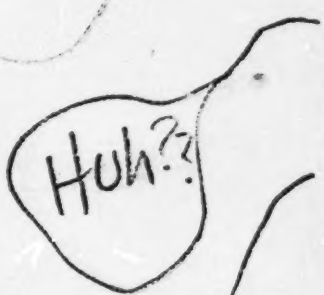
ONE

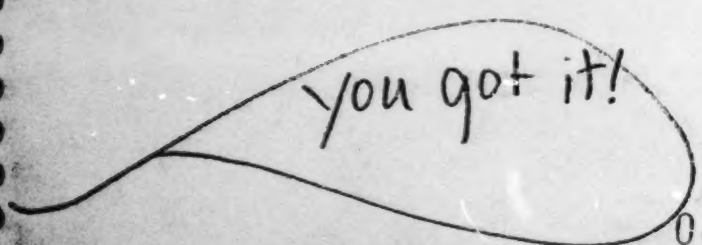




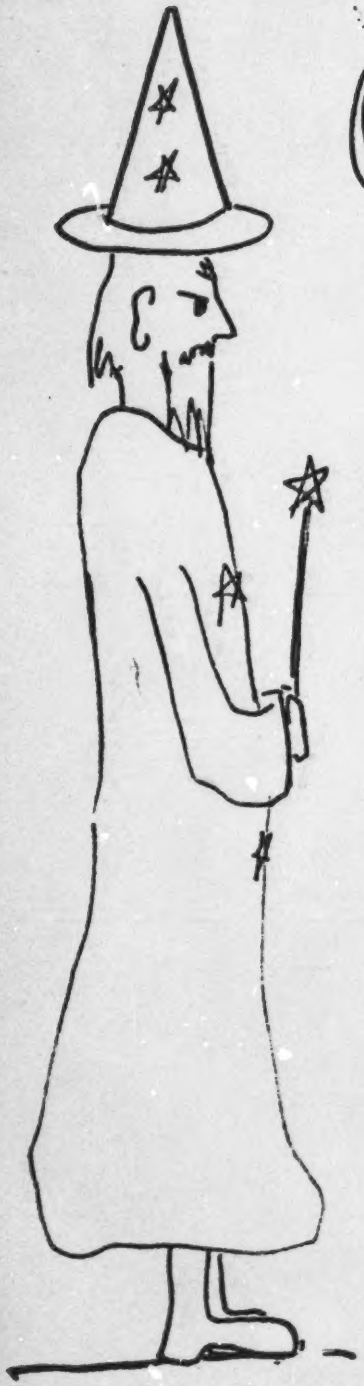
★ EXAMPLE ★....

$526 \times 1 = 526$!





★6★



ONE is called the Identity number for MULTIPLICATION because when you MULTIPLY by ONE (1), a number keeps it's Identity!

That sounds easy! let's try SOME...!

0 x 1 =

4 x 1 =

6 x 1 =

7 x 1 =

12 x 1 =

100 x 1 =

BONUS ★★ (Use the COMMUTATIVE PROPERTY)

1 x 6479 =

Five

To MULTIPLY by 5 (five) think of counting by fives.

Sure!

Can I use my fingers?

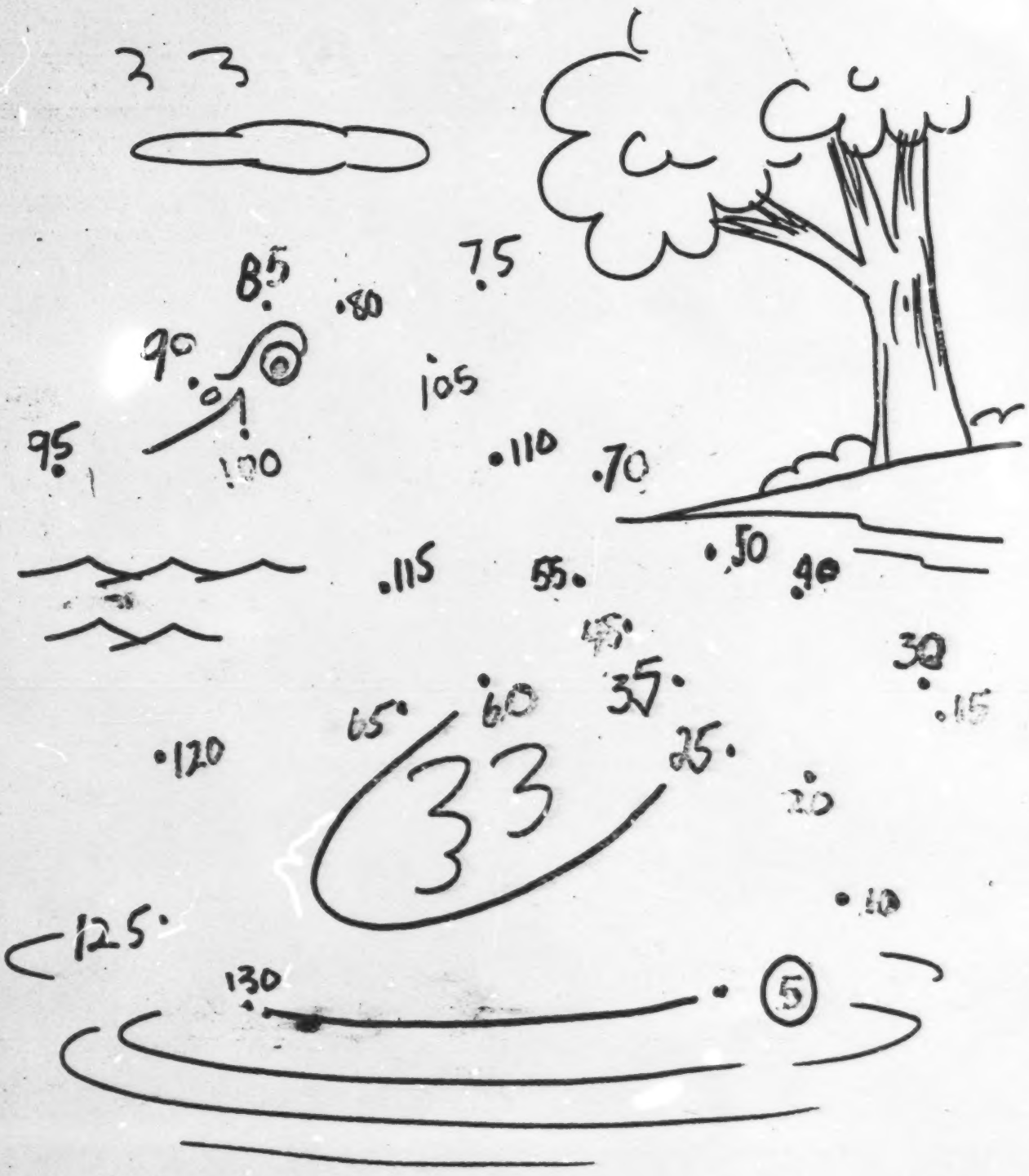
5, 10, ___, ___, 25, ___, 35,

40, ___, ___.

They all end in _____ or _____.

(Fill in the answer →)

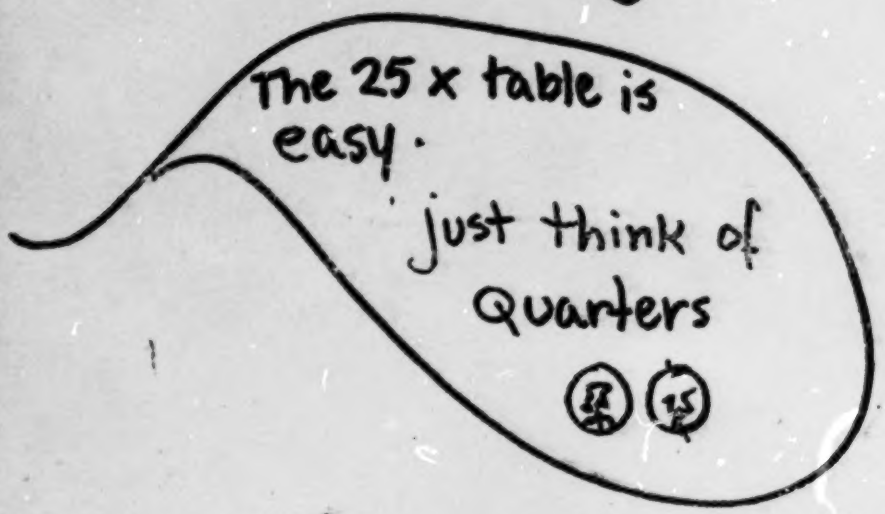
★ 8 ★

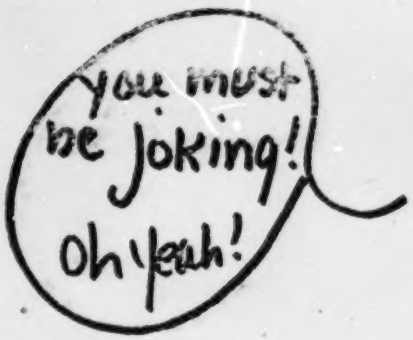


CONNECT THE DOTS ... COUNT BY 5's (fives)

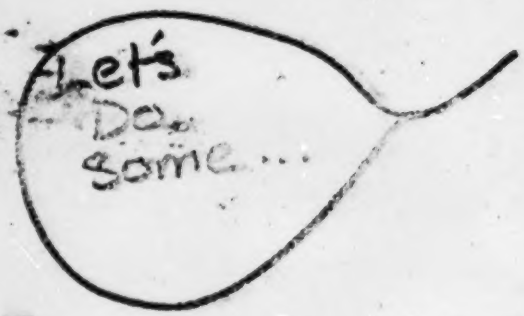
★ 9 ★

twenty-five





25 x 3 = (How much money is 3 Quarters?)



25 x 2 =

25 x 4 =

25 x 0 =

25 x 1 =

25 x 5 =

25 x 8 =

25 x 7 =

25 x 6 =

25 x 9 =

25 x 10 =

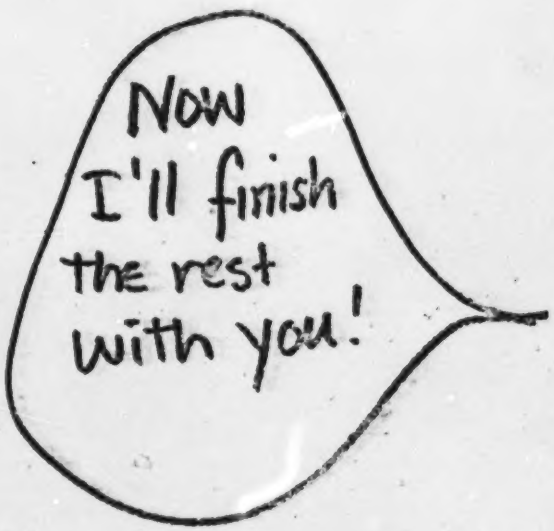
25 x 11 =

★ 10 ★

ELEVEN .....

MULTIPLYING BY ELEVEN IS EASY!
CAN YOU FIND THE PATTERN?
(There is one).

$1 \times 11 = 11$
$2 \times 11 = 22$
$3 \times 11 = 33$
$4 \times 11 = 44$
$5 \times 11 = 55$
$6 \times 11 =$
$7 \times 11 =$
$8 \times 11 =$
$9 \times 11 =$



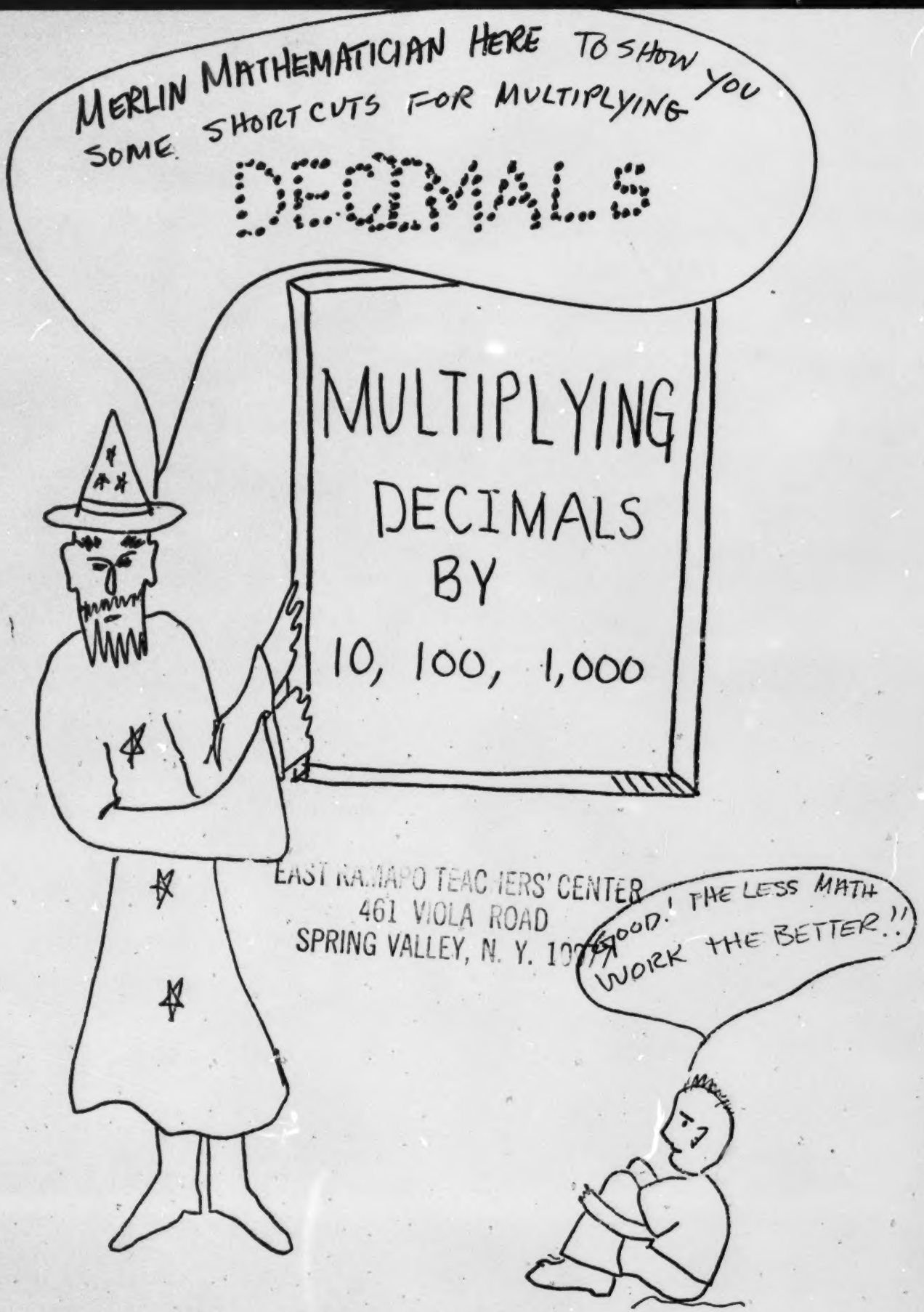
NOW TRY SOME MIXED UP!

(COMMUTATIVE PROPERTY)

$6 \times 11 =$ $9 \times 11 =$ $11 \times 2 =$

$4 \times 11 =$ $1 \times 11 =$ $0 \times 11 =$

DID WE FOOL YOU?


MERLIN MATHEMATICIAN HERE TO SHOW YOU SOME SHORTCUTS FOR MULTIPLYING
DECIMALS
MULTIPLYING
DECIMALS
BY
10, 100, 1,000
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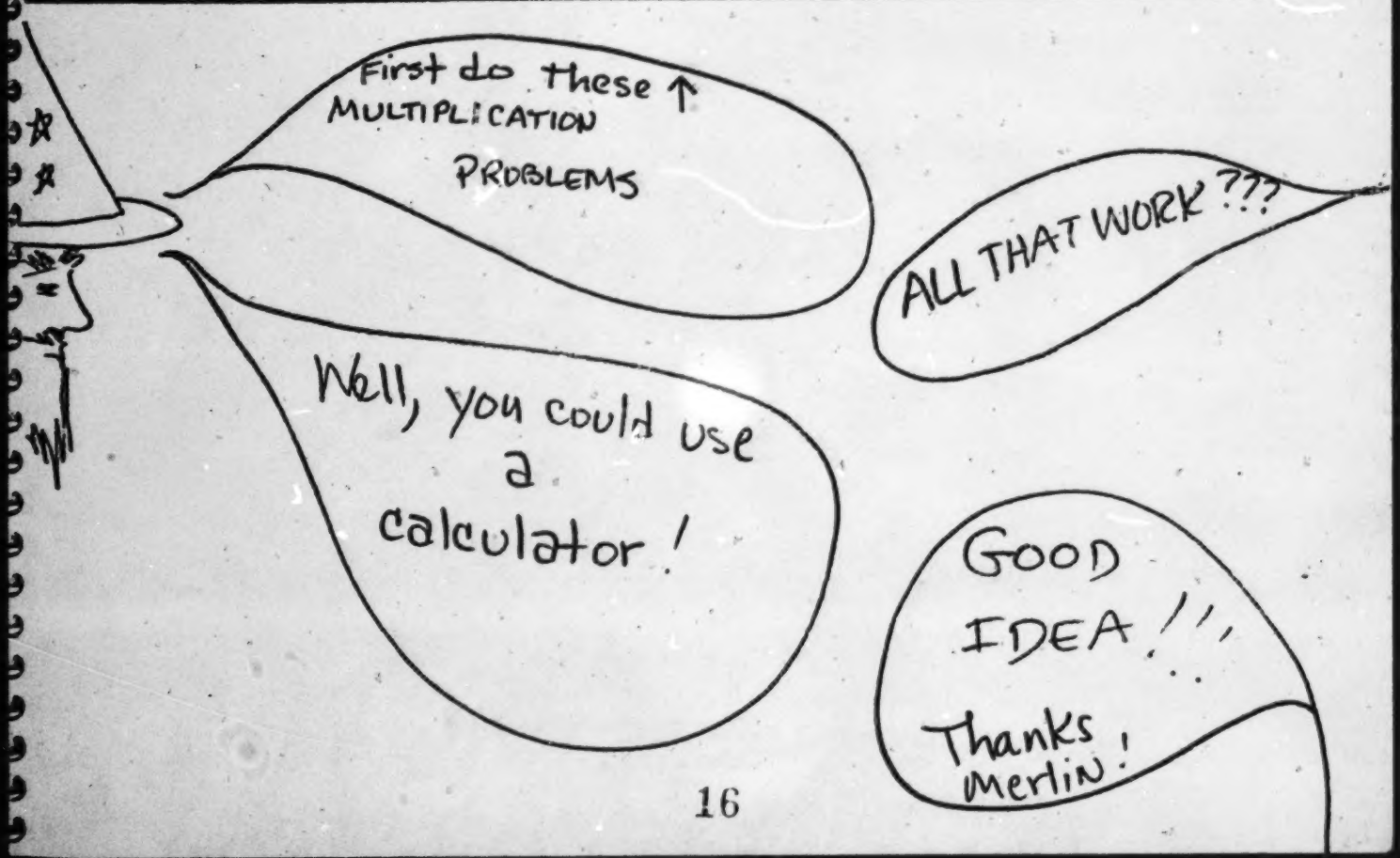
GOOD! THE LESS MATH
WORK THE BETTER!!

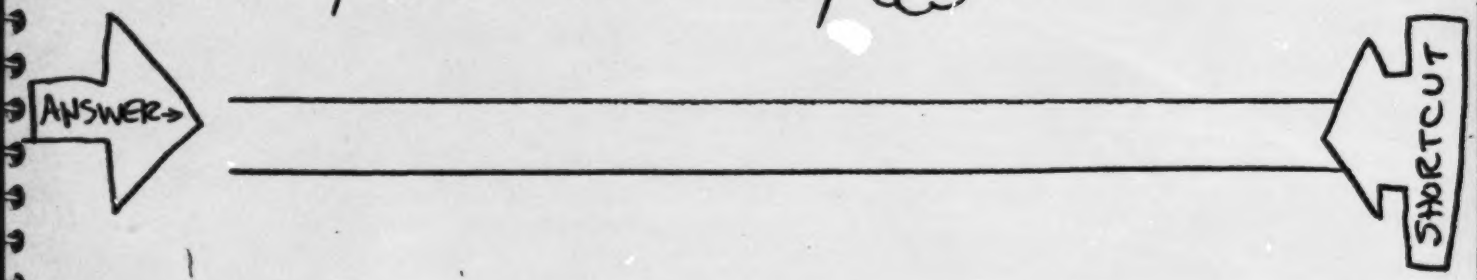
6.52 x10	2.9 x10	.384 x10	8.361 x10

7.02 x10	.74 x10	1.3 x10	.05 x10	.9 x10



COMPARE YOUR ANSWERS TO THE NUMBERS THAT WERE MULTIPLIED BY 10!

WHAT HAPPENS TO THE DECIMAL POINT WHEN YOU MULTIPLY BY 10??



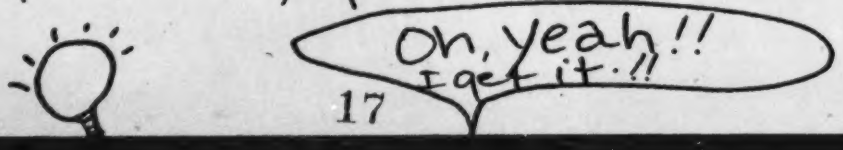
NOW DO THESE ↓↓↓

(You may be so smart you don't have to use the calculator!)

26	8	251	19	50	77
×10	×10	×10	×10	×10	×10
____	____	____	____	____	____

Remember!! that 26 = 26.0

Can you see that the rule is still the same when you multiply a whole number by 10.



★4★

Use your shortcut to do these examples ↓

(you may check (✓✓) by using the calculator!)

$8.63 \times 10 =$

$58.97 \times 10 =$

$3.4 \times 10 =$

$.53 \times 10 =$

$4.816 \times 10 =$

$16 \times 10 =$

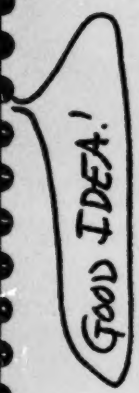
$40.7 \times 10 =$

Did you get them all right ??? _____

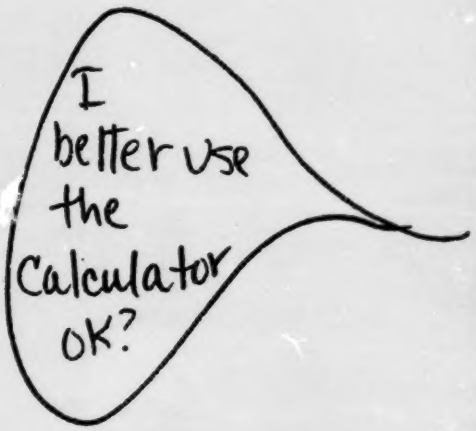
Give yourself a ★!

thanks Merlin

Try these to see what happens if you multiply by (100).



4.628 x 100 =
3.95 x 100 =
18.67 x 100 =
.254 x 100 =
7.8142 x 100 =



Look at your answers.
Write a rule to tell what happens when you multiply by (100).

⇨

TRY THESE ↓ ON THE CALCULATOR:

3.9 x 100 = .4 x 100 = 56.7 x 100 =
18 x 100 =

Is the rule still the same? ___ Remember,
18 = 18.0 = 18.00 = 18.000 = 18.0000 = 18.00000 =

Do these without your calculator.
(No cheating!)

$8.621 \times 100 =$

$.34 \times 100 =$

$16.4 \times 100 =$

$25 \times 100 =$

$.581 \times 100 =$

$.8 \times 100 =$

I told you it would be a short cut!
M.M.

★ When you multiply by 10 the DECIMAL Moves one (1) place to the RIGHT →.

★ When you multiply by 100 the DECIMAL moves two (2) places to the RIGHT →.

★ When you multiply by 1000 the DECIMAL Moves _____.

(Now You've got it!!! TRY SOME! →

☆ / ☆

...

8.624 x 1000 =

.943 x 1000 =

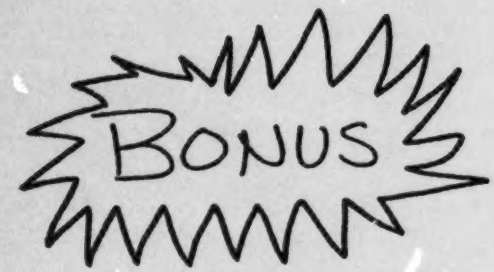
16.407 x 1000 =

18 x 1000 =

(Remember 18 = 18.0 = 18.00 = ...)

75 x 1000 =

.92 x 1000 =



=

154.06 x 1000 =

Put it here partner _____

MATCHING ~~Matching~~ ~~matching~~ ~~MATCHING~~ ~~matching~~

DRAW LINES FROM THE EXAMPLE TO ITS PRODUCT. (answer)

6.5

6.5x10

6.5x100

6500

.65

.0065x100

650

65

.065x100

6.5x1000

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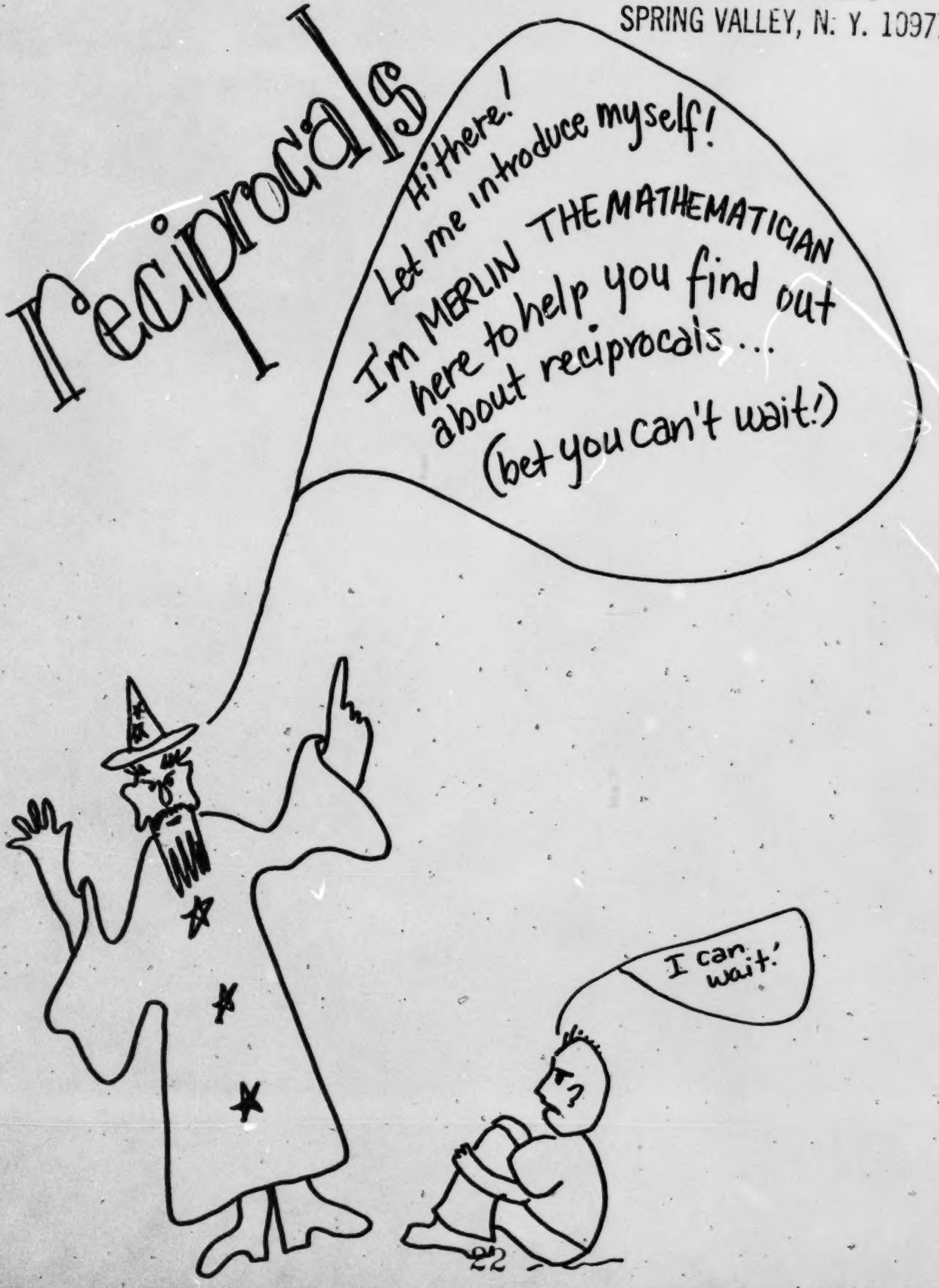
Reciprocals



① When 2 numbers multiply together and the answer is **ONE** the numbers are called reciprocals!

② Multiply these fractions and (Circle) the examples that give the answer ONE (reduce to make your work easier)

$\frac{1}{2} \times \frac{1}{3} =$

$\frac{2}{3} \times \frac{3}{2} =$

$\frac{8}{12} \times \frac{12}{8}$

$\frac{5}{11} \times \frac{11}{5} =$

$\frac{4}{5} \times \frac{5}{4} =$

$\frac{1}{9} \times \frac{9}{1} =$

$\frac{8}{3} \times \frac{3}{8} =$

$\frac{5}{10} \times \frac{10}{5} =$

③ Did you find 5 pairs? List them below:

Fraction	reciprocal

★ IF YOU DIDN'T FIND THEM ALL --- CHECK AGAIN.

Look back at the chart... Do you see a Pattern?

Tell how you make the reciprocal of a Fraction?

→ _____

_____

_____

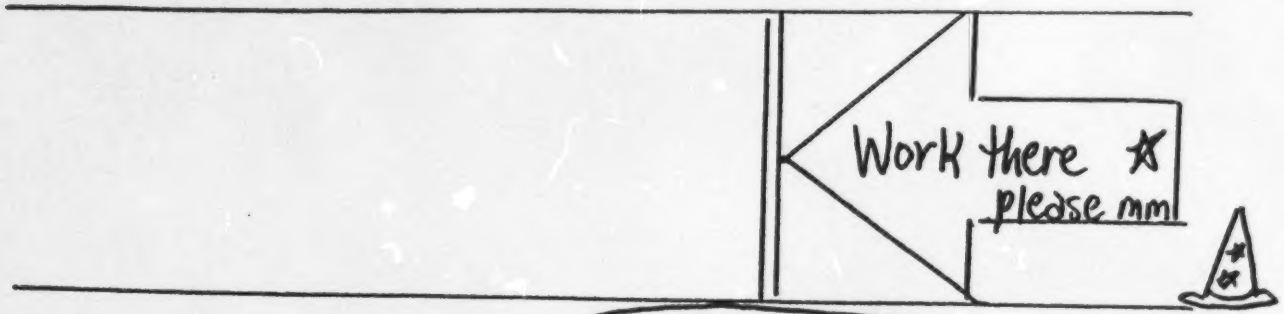
☆ hint:

Write the reciprocal of each fraction:

$\frac{3}{7}$ $\frac{2}{3}$ $\frac{15}{6}$

$\frac{4}{5}$ $\frac{1}{8}$ $\frac{7}{12}$

Pick a pair from page 2 and show that when you multiply you will get ONE.



Now you KNOW it's easy to make the reciprocal of a fraction. Just turn it ʍnop ɹǝdɯnu

$3\frac{1}{2}$

★ but what about mixed numbers? Like

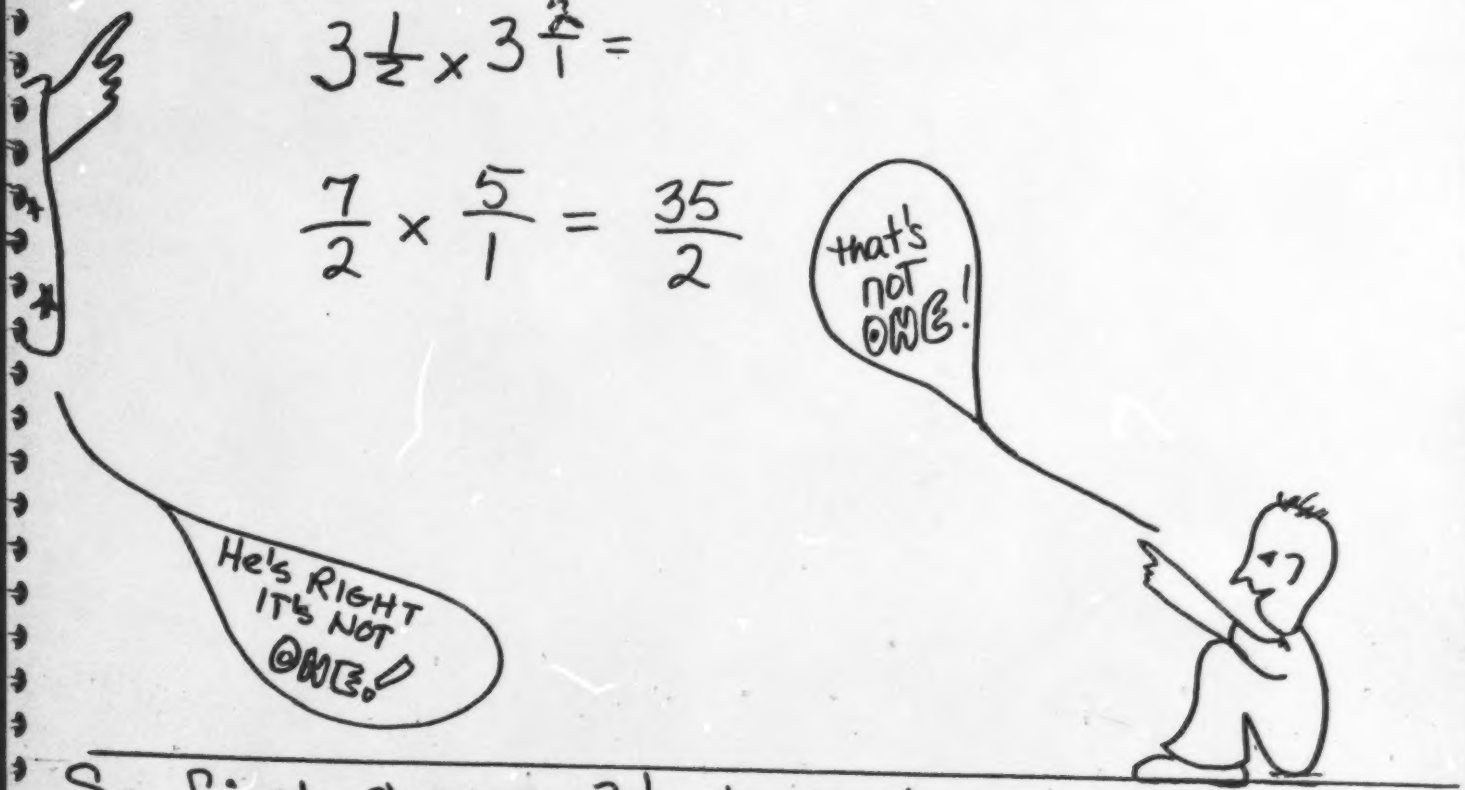
TURN TO FIND OUT →

★4★

if you just turn $\frac{1}{2}$ upside down the answer won't be ONE... SEE!

$3\frac{1}{2} \times 3\frac{2}{1} =$

$\frac{7}{2} \times \frac{5}{1} = \frac{35}{2}$



So first change $3\frac{1}{2}$ to an improper fraction

$3\frac{1}{2} = \frac{7}{2}$

then turn it upside down..... $\frac{2}{7}$ is the reciprocal of $3\frac{1}{2}$!

✓ (check) $3\frac{1}{2} \times \frac{2}{7}$

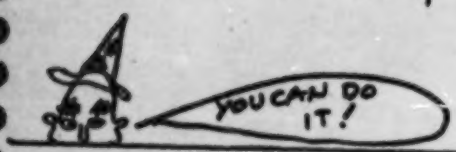
$\frac{7}{2} \times \frac{2}{7} = \frac{14}{14} = 1$

★5★

Write the reciprocals of these mixed numbers.
(remember to change to improper fractions 1st.)

$8\frac{2}{3}$ $7\frac{2}{5}$ $6\frac{1}{2}$

$5\frac{1}{4}$ $3\frac{1}{3}$



Now pick one pair from above and multiply to check (✓).

? How can we make the reciprocal of a whole number ?

$6 \times 9 = 54$

WRONG!!! Not ONE.

$4 \times h = ?$

huh? What's that??!! I don't know..... ME NEITHER...

Write the whole number as a fraction first.

$$7 = \frac{7}{1}$$

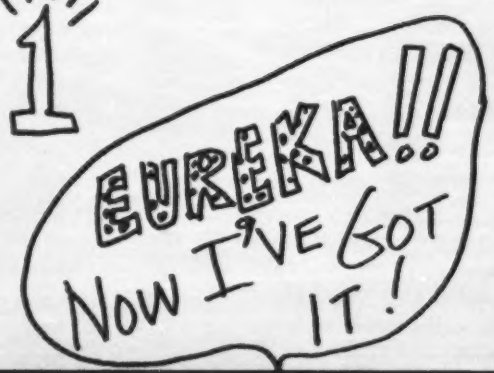
then turn it upside down

$$\frac{1}{7}$$

to see if it's the reciprocal.

$$7 \times \frac{1}{7}$$

$$\frac{7}{1} \times \frac{1}{7} = \frac{7}{7} = 1$$



★7★

Write the rule for making the reciprocal of a whole number ⇩ (PUT IT THERE PARTNER) M.M.

PUT THE NUMBER OVER _____

TURN IT _____.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Write the reciprocal of these whole numbers::

4 6 2

7 8 3

Multiply a pair together to show that the answer is ONE.

★(you're really getting there) m.m.

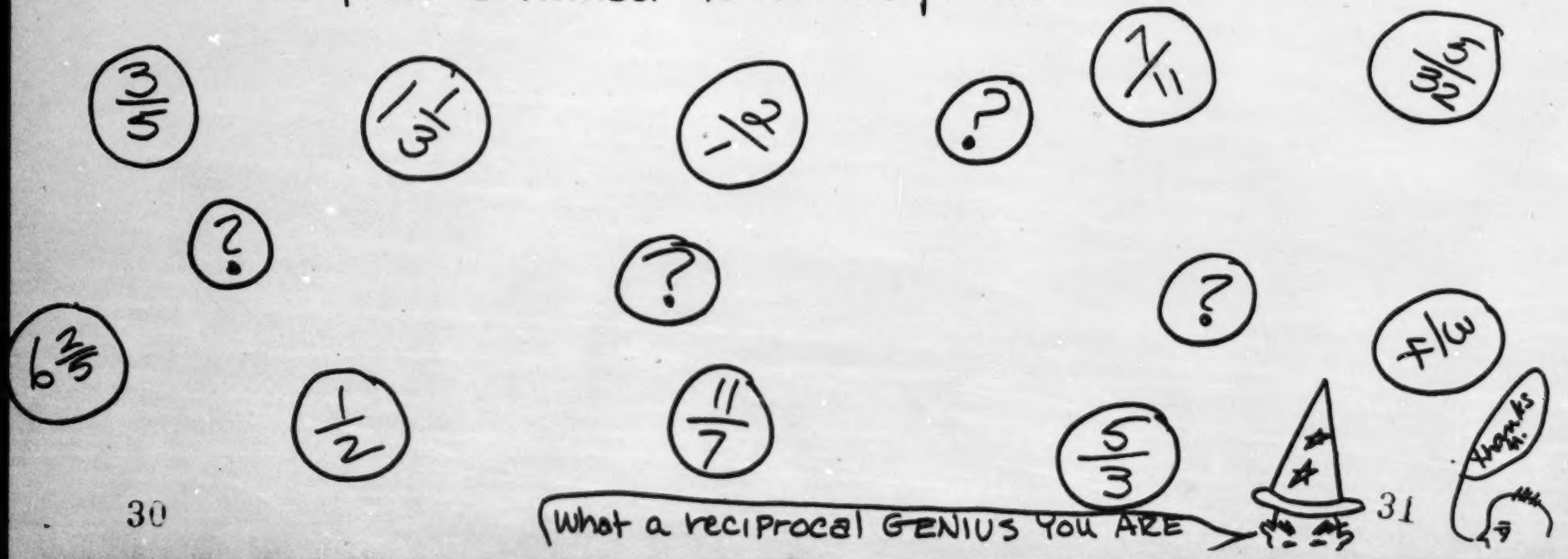
① Practice them all together.
Write the reciprocal for each number:

$\frac{2}{3}$ 7 $8\frac{2}{3}$ $\frac{7}{9}$

$4\frac{1}{2}$ $\frac{9}{5}$ 17

MATCHING ... Matching ... Matching ... Matching ... Matching

② Draw lines from a number to it's reciprocal:



FINDING OUT ABOUT RATIO & PROPORTION

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1- Work with a partner

2- Get the can of Chips and the can of Beans

3- Pick a number from 1 to 5. Have your Partner pick a different number.

4- Write your numbers on the first line of the chart ★★★★★ ON PAGE. 3.

5- Take your number of Beans from the can.

6- Have your partner take his or her number of Chips.

7- Keep your Beans in a pile in front of you, and have your partner keep the Chips in a pile.

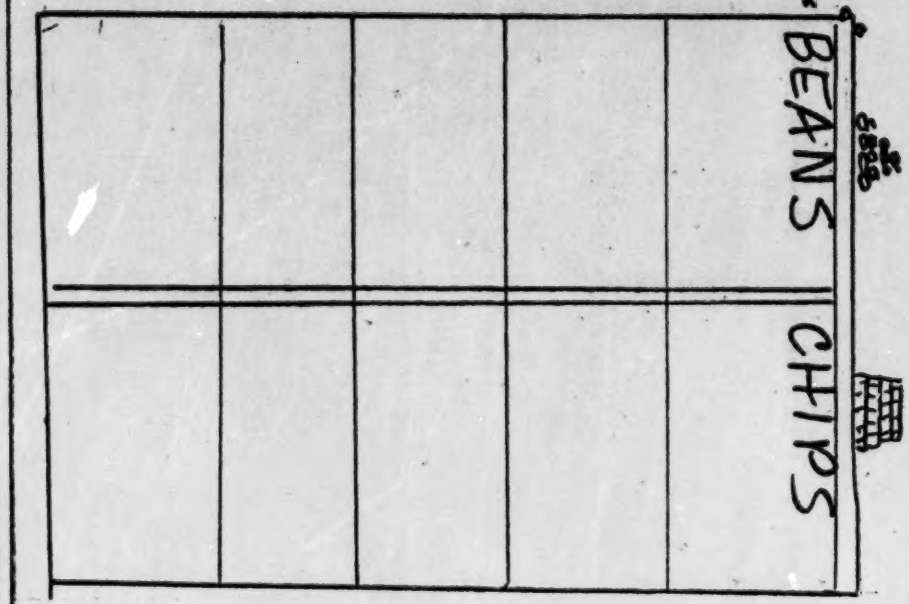
8- Pick like you did in Steps #5 & 6, four more times.

9- Add the Beans and Chips to the proper piles and keep writing the total number on your chart.

1- Make another chart:
Start by picking 6 Beans and 5 Chips.

2- Keep picking 6 & 5 to fill in the Chart

BEANS	CHIPS
6	5



1- Look at the second chart Each pair of picks is called a RATIO.

2- The first RATIO is 6 to 5. In math, we can write a RATIO using a colon (like this 6:5), it still means "6 to 5".

3- Write the RATIOS for the rest of your chart using COLONS.

6:5

_____

_____

_____

_____

NEATNESS COUNTS...

4- How did you get the RATIO 18:15? By picking 6:5, 6:5, 6:5. RATIOS that come from picking like this are called EQUIVALENT RATIOS or PROPORTIONS

5. We show PROPORTIONS with equal signs (6:5=18:15)

6. Fill in the numbers missing from these PROPORTIONS. Then check on the chart.

6 : 5 = 12 : □

6 : 5 = 30 : □

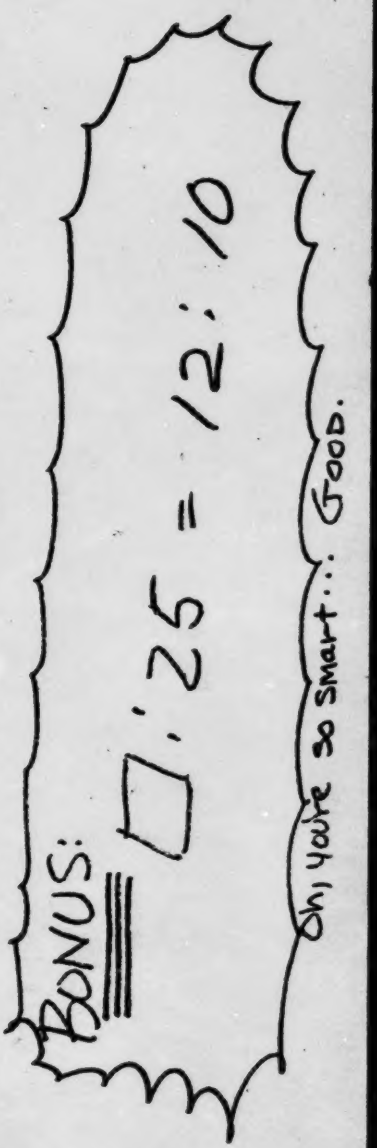
6 : 5 = □ : 20

6 : 5 = □ : 10

□ : 10 = 6 : 5

24 : □ = 6 : 5

24 : □ = 36 12 : 10



New Nuevo NEW

Here is a new RATIO

7 : 4

NEW New eeeee

Fill in the chart. Pick Beans and Chips to Check Your answers.

7	14
14	
21	
	16
	20

Missing Pieces ... ? I'm missing a number in my Proportion. Help.....

FILL IN THE MISSING NUMBERS IN THE PROPORTIONS.

$7:4 = 14:\square$ $7:4 = 35:\square$

$7:4 = \square:42$ $\square:28 = 7:4$

think about a chart that starts with 3:4. Fill in the missing numbers in these PROPORTIONS:

AGAIN, THEY'RE MISSING ?? Oh, of course!!

$3:4 = 9:\square$ $\quad 3:4 = \square:20$

$3:4 = \square:16$ $\quad 3:4 = 21:\square$

HARD ONES: WATCH OUT!!

$9:12 = \square:20$

$6:8 = 21:\square$

$15:20 = \square:12$

IF YOU ARE STUCK ON THE HARD ONES THINK OF WHAT 9:12, 6:8, AND 15:20 EQUAL WITH SMALLER NUMBERS.

HELP

Now, fill in the missing number in these PROPORTIONS:
(THE FIRST RATIO KEEPS CHANGING... BE CAREFUL)

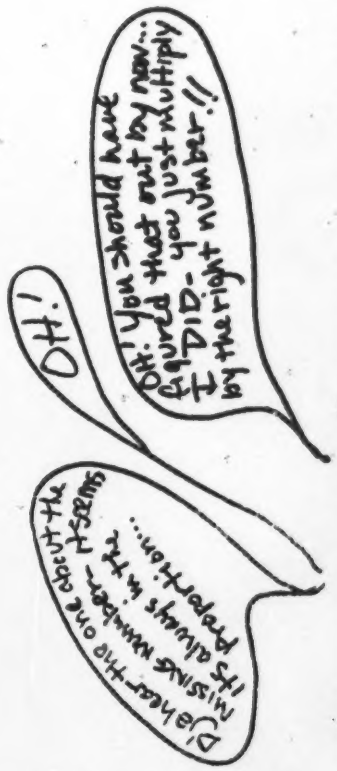
$5 : 4 = \square : 12$

$2 : 3 = 14 : \square$

$5 : 2 = 10 : \square$

$7 : 4 = \square : 20$

$8 : 3 = 16 : \square$


Oh! You should have divided that out by now!! It's a lot easier than multiplying by the right number!!
Oh!
Ja hear-this one doesn't have missing numbers in the proportion...

THE HARD WAY: (FILL IN THE FIRST RATIO)

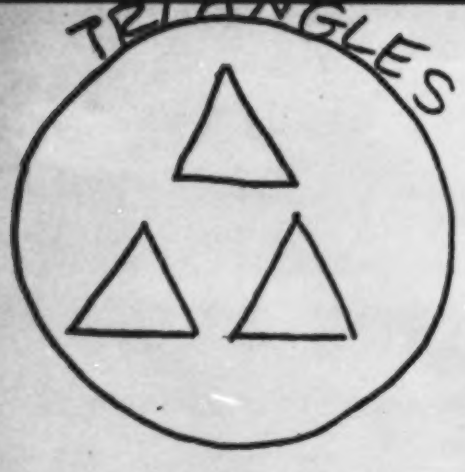
$\square : 2 = 12 : 6$

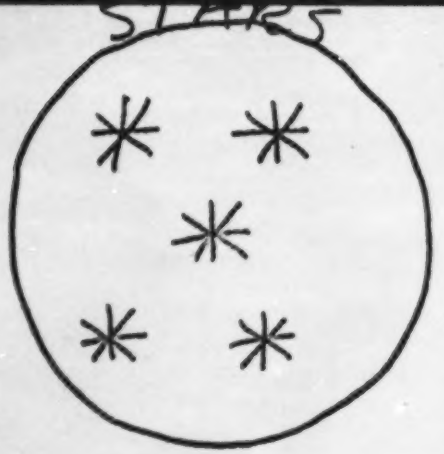
$5 : \square = 15 : 12$

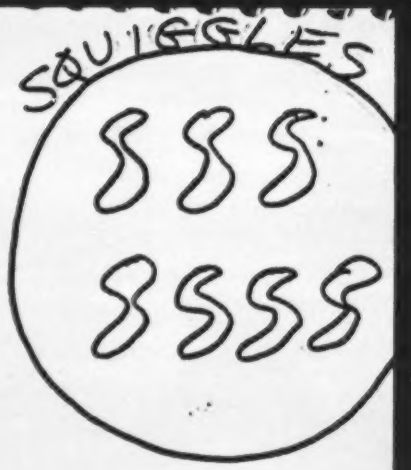
$3 : \square = 9 : 21$

MISSING MISSING, MISSING, MISSING, MISSING.....

KEEP ON TRUCKIN'... ALMOST THERE →







WRITE RATIOS TO COMPARE THE NUMBER OF:
(Keep the correct order)

STARS TO SQUARES 5:4

stars to squiggles _____

Triangles to stars _____

Squiggles to Squares _____

SQUIGGLES To SQUIGGLES _____

Squares to Stars _____

★ BONUS ★ : STARS TO SQUARES TO TRIANGLES _____

★10★

FIND THESE WORDS:

COLON
PROPORTION
RATIO
COMPARE
BEANS
CHIPS

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RATIOS

12cm.

USING

8cm.

LENGTHS

10cm.

COMPARING

15 cm.

---

you need:

1. a centimeter ruler
2. Cuisenaire rods; red, dark green, yellow, brown.
3. Nail
4. clothespin

Now lets get to work ..... >

Measure the RED ROD _____ cm.
(cm. means centimeters)

Measure the GREEN ROD _____ cm.

To compare the length of the RED ROD to the GREEN ROD we would say 2:6.

Now... make a train of RED RODS as long as one GREEN ROD.

How many RED RODS make a GREEN ROD? _____

Another way to compare the RED to the GREEN is to say 1:3

1★ Measure and record each length:

RED ROD _____ BROWN ROD _____

GREEN ROD _____ NAIL _____

YELLOW ROD _____ CLOTHESPIN _____

2★ Write a ratio to compare each of the following lengths:

RED to BROWN _____

YELLOW to BROWN _____

NAIL to CLOTHESPIN _____

GREEN to BROWN _____

RED to YELLOW _____

YELLOW to GREEN _____

YELLOW to BROWN 45

BROWN to YELLOW _____

1. How many RED RODS equal one BROWN ROD? _____

2. How many RED RODS equal one GREEN ROD ? _____

3. Use these numbers (from above) to write RATIOS that compare:

RED to BROWN

RED to GREEN

BROWN to GREEN

GREEN to BROWN

4. Measure, with your centimeter ruler,

* the length of your desk. _____
* the width of your desk _____
* the length of your textbook _____
* your height 46
* the length of your arm. _____

(5) Use the numbers from the other page to compare with RATIOS...

* ★ length of desk to width _____
* ★ length of book to length of desk _____
* ★ your height to the length of your arm _____
* ★ the length of your arm to your height _____

PROBLEMS PROBLEMS PROBLEMS PROBLEMS PROBLEMS

Justine's book is 24 cm. long and 16cm. wide. Circle all the RATIOS that could be used to compare the:

length to width

16:24

24:16 3:8 4:8 4:7

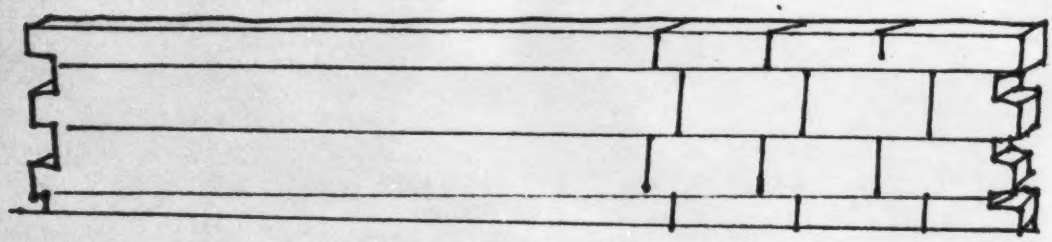
8:4

8:3 3:2 4:6

5:7

★ Write a RATIO for each story.

RATIO: _____



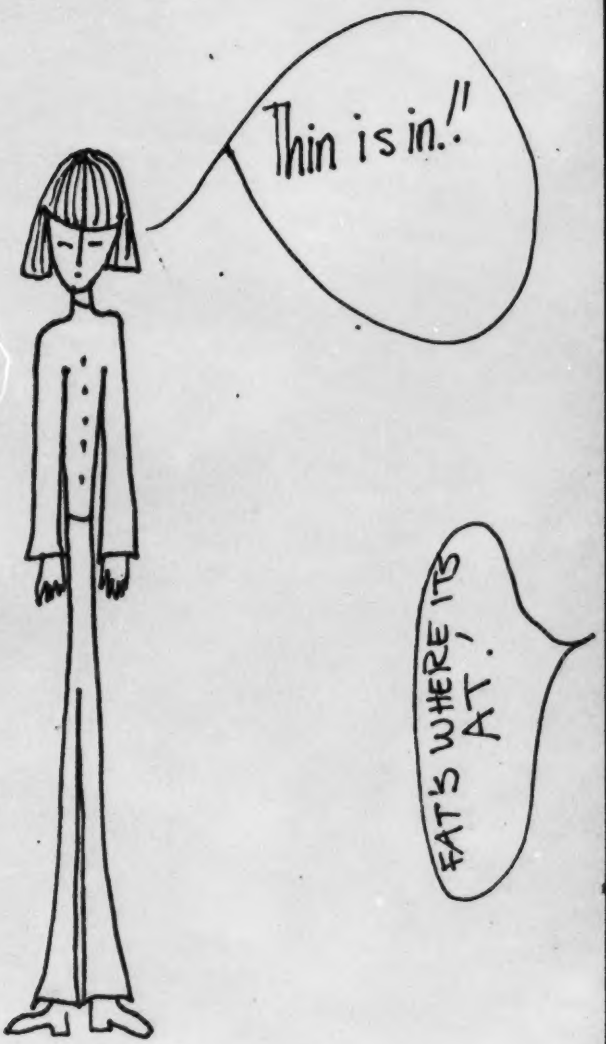
Marinda is building a brick wall. It will be 24 bricks long and 8 bricks high.

A dog wins a tug of war with a boy, because there are 10 pounds of dog for every 8 pounds of boy.

RATIO: _____

★ A very thin lady weighs 100 pounds and is 65 inches tall.

RATIO _____



★ The sailboat "Caron T." can go 30 miles in 6 hours.

RATIO _____

Measure each line below using the centimeter ruler. Let each letter represent the length of the segment and complete the following:

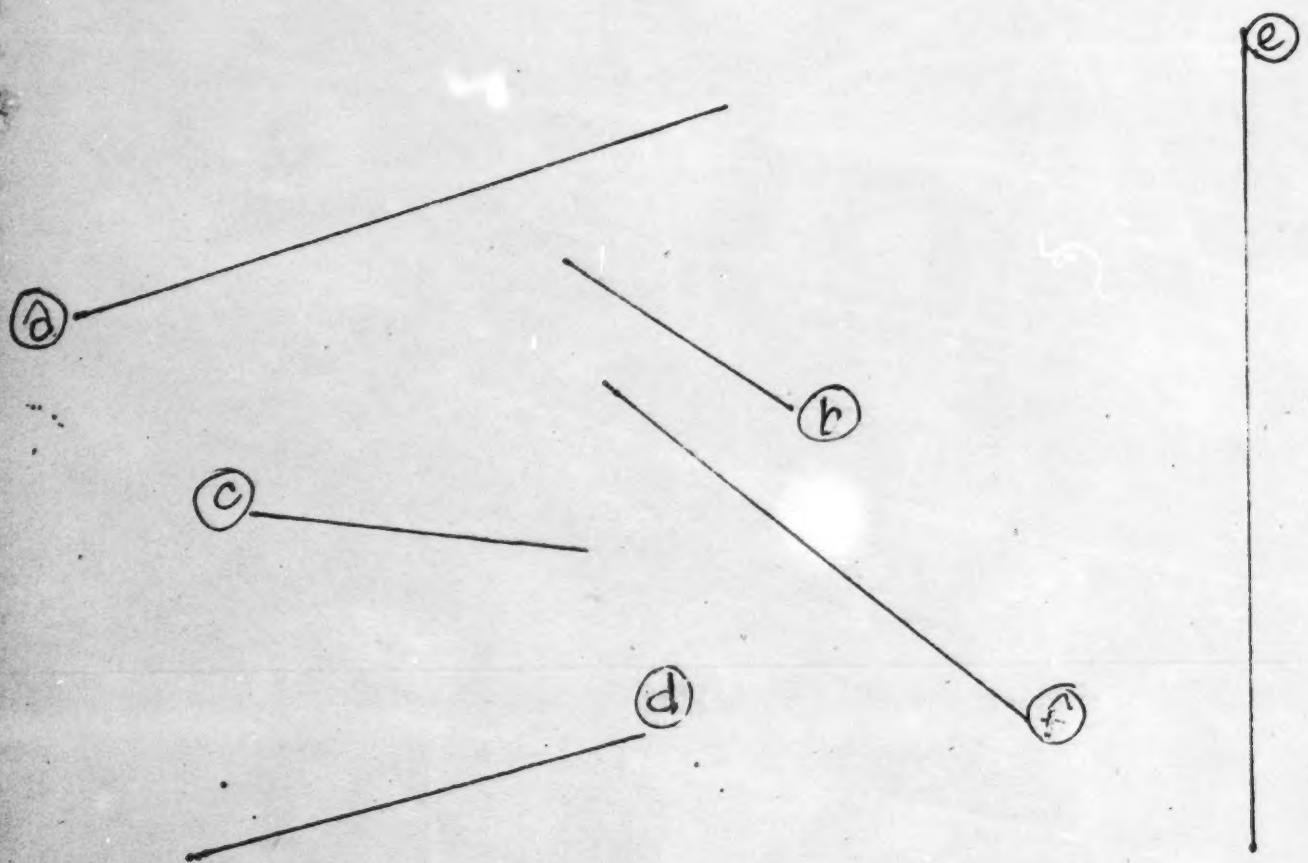
EXAMPLE:

2:3 = f:e

1 : 3 = _____

5 : 2 = _____

7 : 5 = _____



FINDING SQUARES

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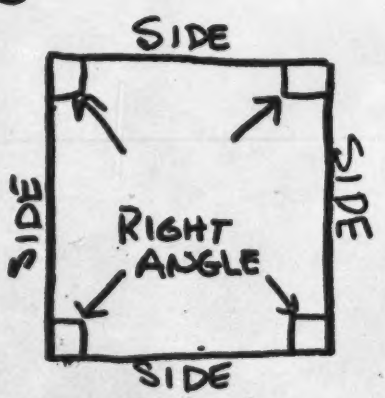
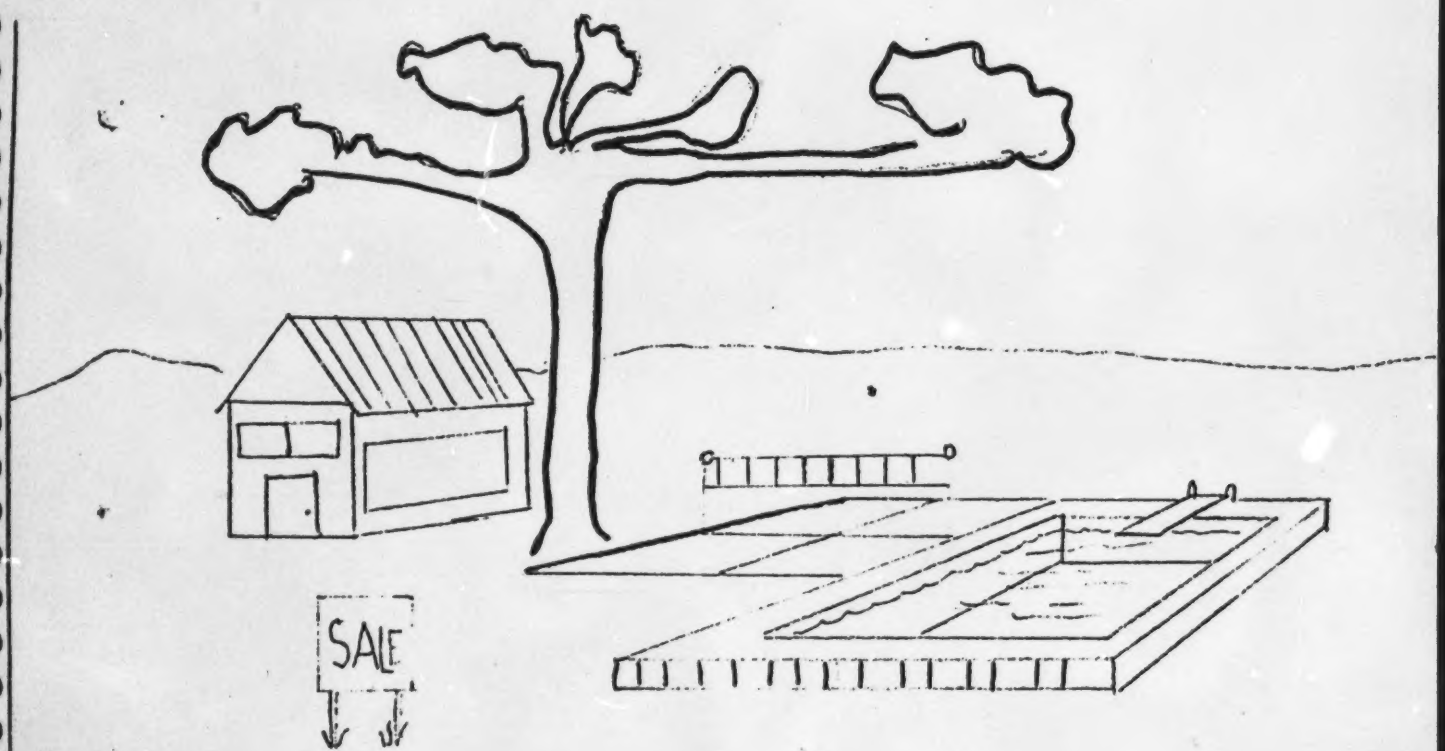
- SQUARES are special shapes
- SQUARES have 4 sides that are the same length.
- SQUARES have 4 corners that are called right angles.

HERE ARE THE PARTS OF A SQUARE THAT YOU SHOULD KNOW:



□ 2 □

Many things are made up of SQUARES. Find the SQUARES in this picture and shade them in RED.



List some things in school that look like SQUARES:

_____

_____

_____

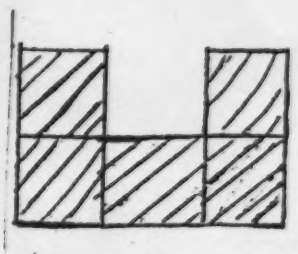
□3□

Grid paper or Graph Paper is made up of SQUARES. Use grid paper to record your answers after you do the following experiments with SQUARES.

1□ Use 5 cardboard SQUARES. Put them together so that they fit side by side, but do not overlap.

Each SQUARE may touch one or more other SQUARES.

HERE IS ONE PATTERN:



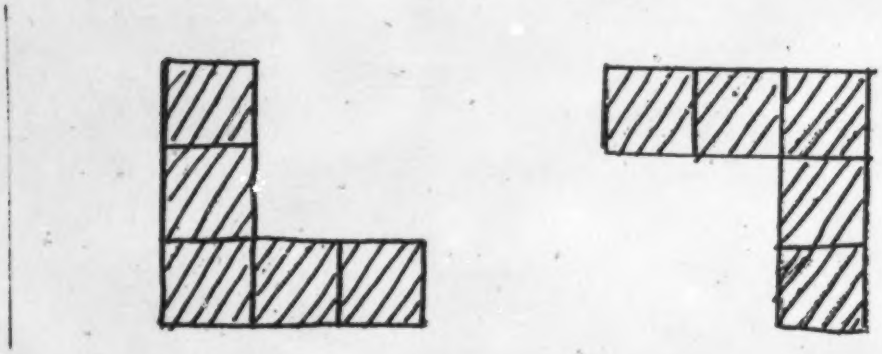
2□ See how many other patterns you can make.

Draw your patterns on the grid paper. Let one SQUARE on the paper represent one of your SQUARES.

Make sure your patterns are really <u>different</u>, not just the same pattern turned upside down or flipped on its side.

□ 4 □

THESE TWO PATTERNS ARE REALLY THE SAME.

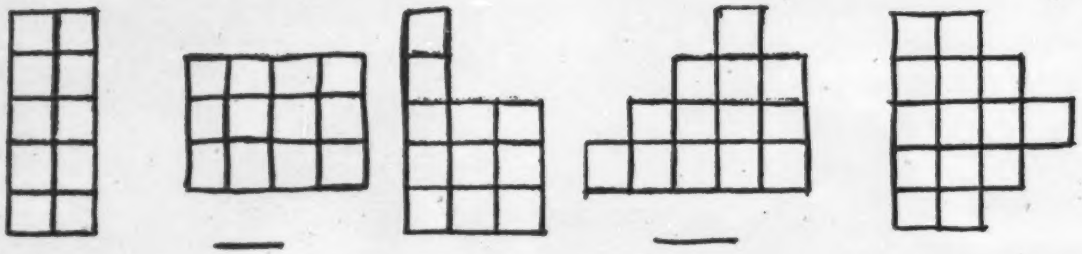


3 □ DID you get all 12 Patterns? if not, go back and get some more!!

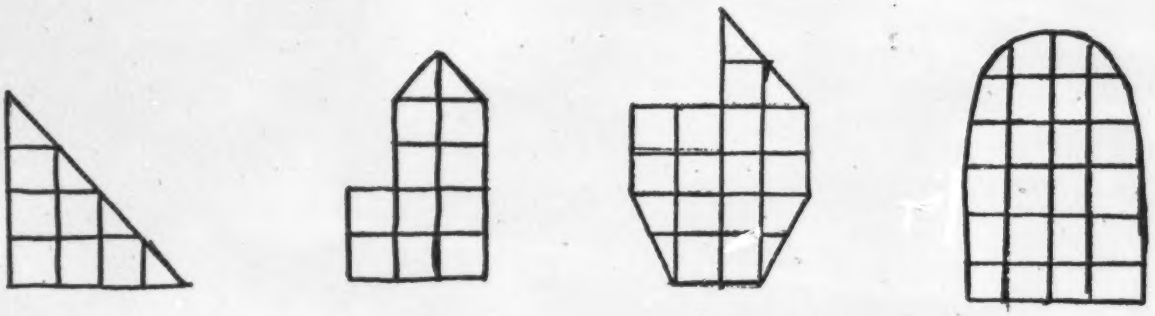
THE SHAPES you just made are called PENTOMINOS. Even though they look different they were all made from 5 SQUARES, so they all have the same AREA, 5 SQUARE units.

□ 5 □

Find the AREA of each of the following shapes by counting the SQUARES. Put your answers in the space near each figure.

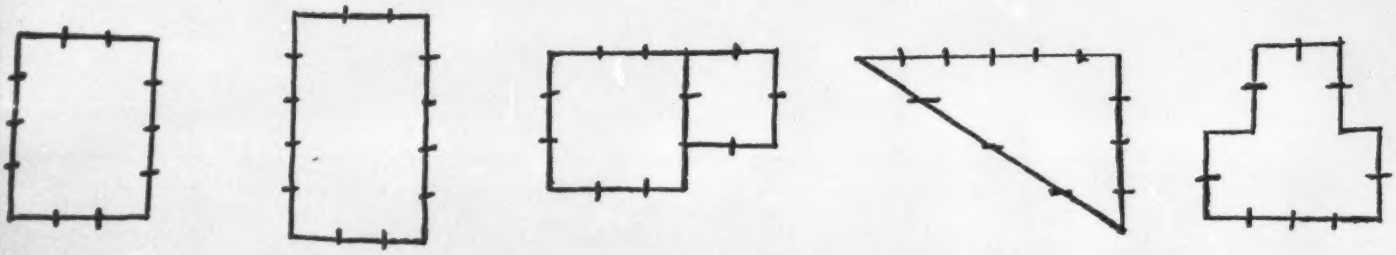


area ____ ____ ____ ____



area ____ ____ ____ ____

Now see if you can find the AREA of these figures:



area ____ ____ ____ ____

MATH BRAINS !! □ 6 □ MATH BRAINS !!

AFTER YOU HAVE DONE ALL THE WORK IN THIS PACKAGE, DO THIS:

cut a piece of grid paper so that it has 6 SQUARES ACROSS and 10 SQUARES down. Try to cut all 12 PENTOMINO patterns from this one sheet of grid paper.

Don't think this is easy !!

You may need a few tries to get it.

Good Luck, Math BRAINS !!

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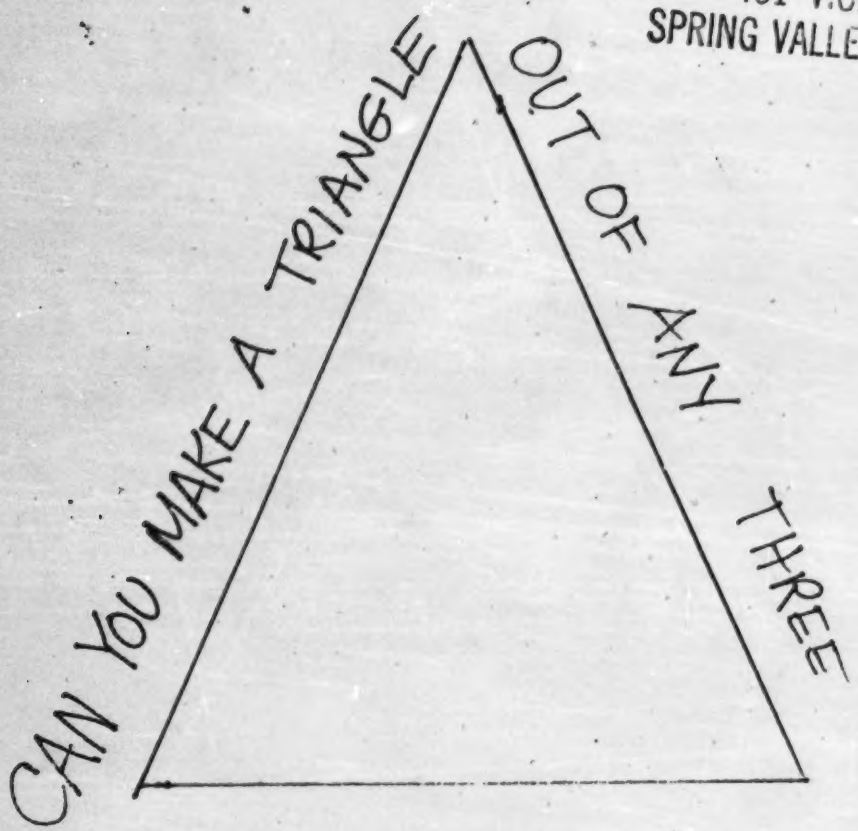


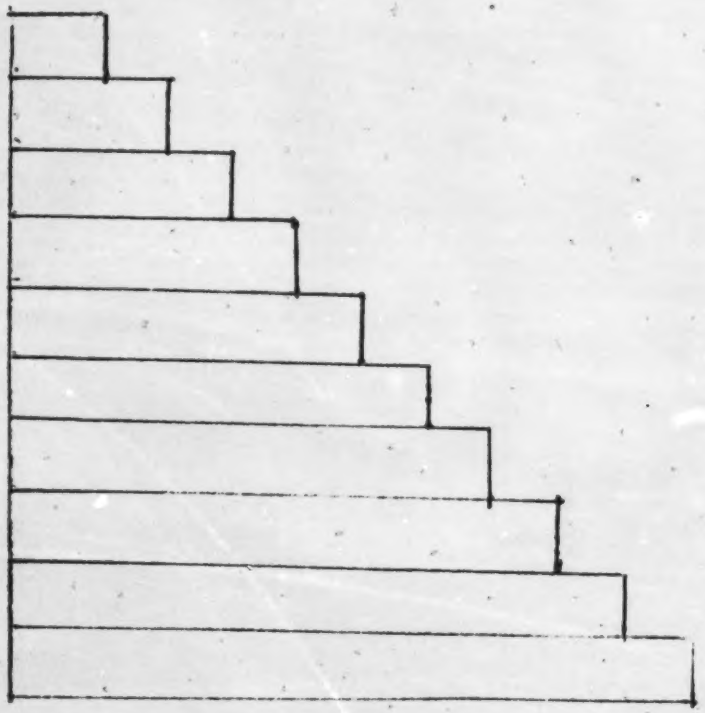
Every one knows that a triangle has 3 sides, but can any 3 lines make a triangle?

You need:

One cuisenaire rod of each color.
(there are 10 colors)

☆2☆

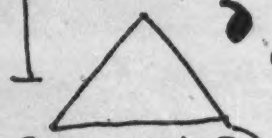
Arrange the rods from smallest to largest. List the colors in order.



White is 1(one). Two whites make one red so... red is 2 Which color rod is 3?_____ 4?_____ 5?_____

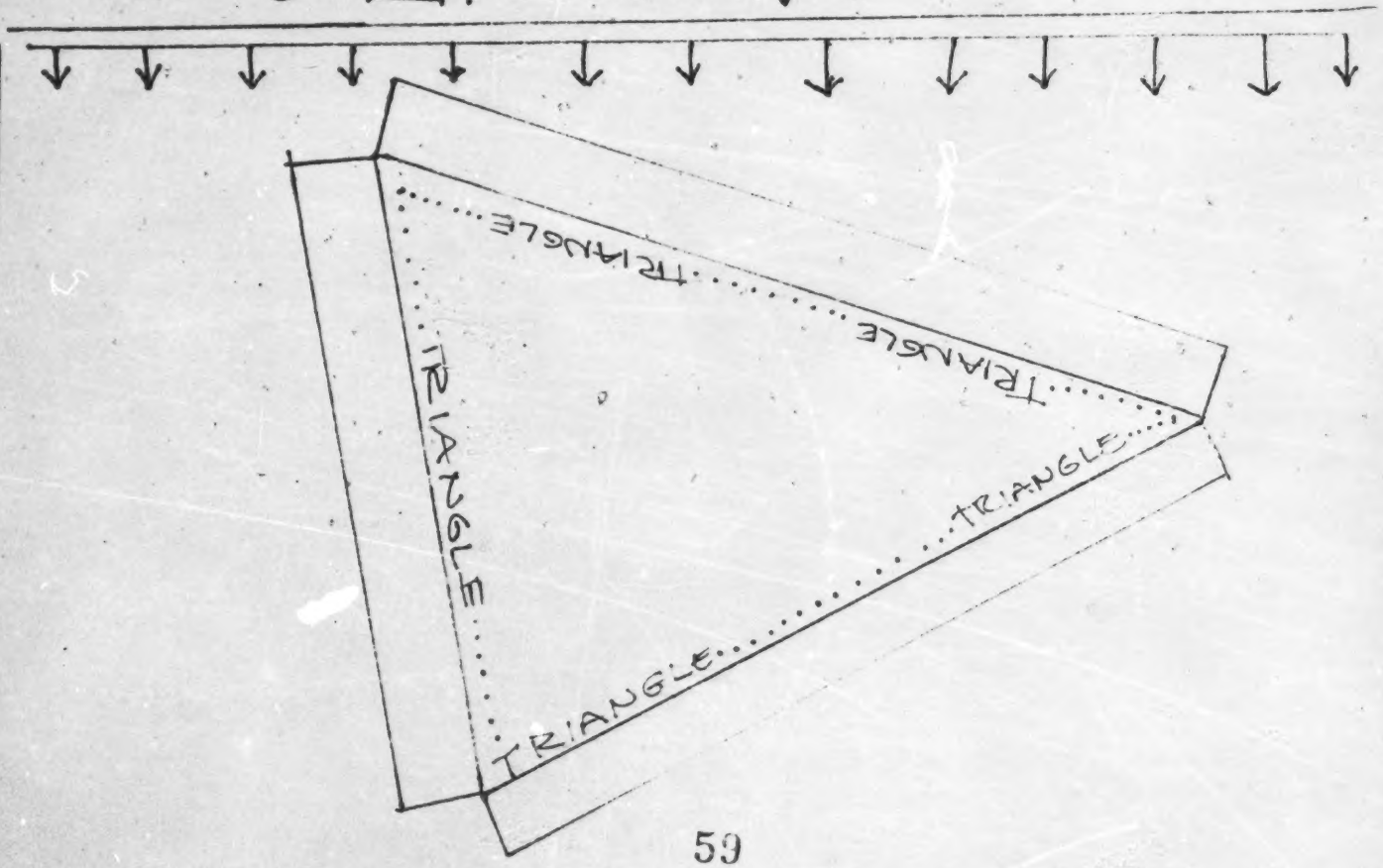
6?_____ 7?_____ 8?_____ 9?_____ 10?_____

You are going to make



's with the RODS.

To do this you must fit the RODS together so they just touch at <u>one</u> corner. The enclosed shape will be a △. Like this↓

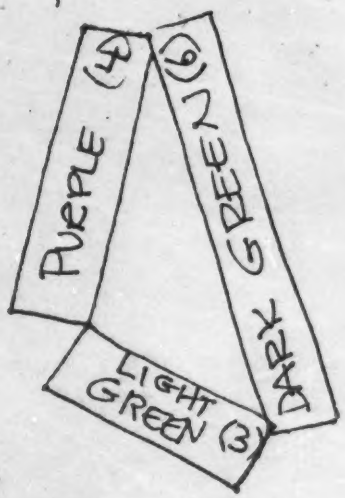


➪ We will call the sides of the △ a, b, c, and c will be the longest side.

➪ Use the correct color Rods to help you make △'s, and fill in the chart. (Look at page #2 to see which color matches each number.)

Example:	Side a	Side b	Side c
	4	3	6

Example: →



Example: →

★5★

Length of Rods used			Can they form a △?	Length of a+b	Length of c	is a+b greater than c?
Side a	Side b	Side c				
Column #1			Column #2	Column #3	Column #4	Column #5
EXAMPLE: 4	3	6	yes	4+3=7	6	yes
4	3	5				
4	3	7				
2	5	6				
3	5	7				
3	5	9				
4	4	6				
5	5	9				
61 5	5	5				
1	4	6				52
8	8	8				

Look at the chart on page 5 and answer these questions.

★ Can EVERY three Rods make a △?

answer: _____

★ Circle the groups of three lengths which made △'s.

★ Compare their lengths of a+b to the length of c. (columns 3+4)

★ Write a rule to tell when 3 lengths will make a △!

write → _____

_____

★ Use your rule to tell if △'s can be made from these lengths:

1, 2, 3 _____ 4, 5, 8 _____ 1, 1, 3 _____ 2, 5, 6 _____

Algebra with RODS

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You need:

- ★ A Full set of CUISENAIRE RODS
- ★ PAPER AND PENCIL

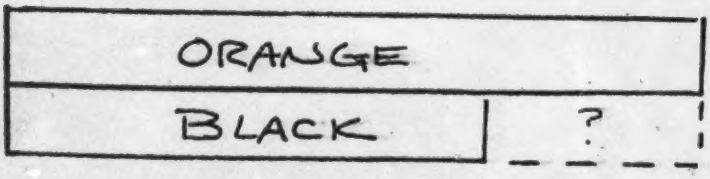
★ 2 ★

★ Compare the BLACK and ORA RODS.

Which one is LONGER? ___

How much LONGER?

FIND A ROD THAT FITS TOGETHER WITH THE BLACK ROD TO MAKE A TRA AS LONG AS THE ORANGE ROD.



The ROD that fits in here is calle

DIFFERENCE

between the LENGTH of the BLA and the ORANGE.

☆ 3 ☆

☆ Which ROD is the DIFFERENCE between:

BLUE and PURPLE _____

DARK GREEN and RED _____

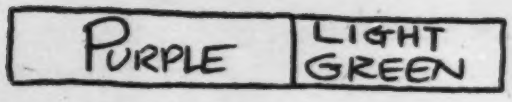
LIGHT GREEN and DARK GREEN _____

RED and WHITE _____

☆ We are going to do alot of work with RODS. Lets make a CODE so we won't have to keep writing the Colors.

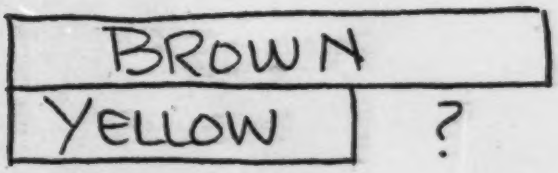
W	for WHITE	D	for DARK GREEN
R	for RED	K	for BLACK
G	for LIGHT GREEN	N	for BROWN
P	for PURPLE	E	for BLUE
Y	for YELLOW	O	for ORANGE

+ means 2 RODS together End to End.



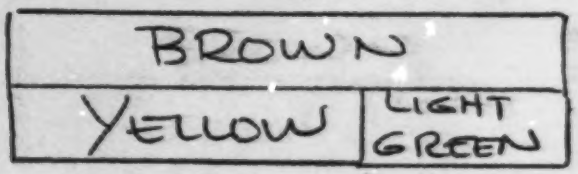
HERE IS P + G.

− means finding the DIFFERENCE



HERE IS N − Y

= Means 2 TRAINS are the same length.



HERE IS N − Y = G OR N = Y + G

Use the Rods to tell if these

EQUATIONS

are TRUE or FALSE .....

W + R = G ____

R + R = P ____

W + G = K ____

P + W = y ____

G - R = W ____

N - y = R ____

R - W = W ____

P - R = N ____

W + W + G = y ____

W + W + R = P ____

TRUE OR FALSE .. TRUE OR FALSE ... TRUE OR FALSE ... TRUE or FALSE ...

★ 6 ★

FORM YOUR OWN TRAINS AND WRITE

5 TRUE EQUATIONS USING THE +.

★

★

★

★

★

FORM YOUR OWN TRAINS AND WRITE

5 TRUE EQUATIONS USING THE —.

★

★

★

★

★

★7★

Use the RODS to make these TRAINS.

P+W=Y

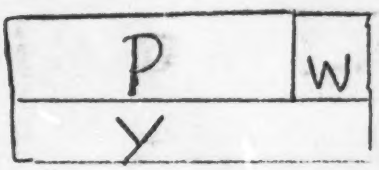
R+R=P

G+W=P

D=P+R

W+D+R=E

★★★: THIS IS → : P+W=Y

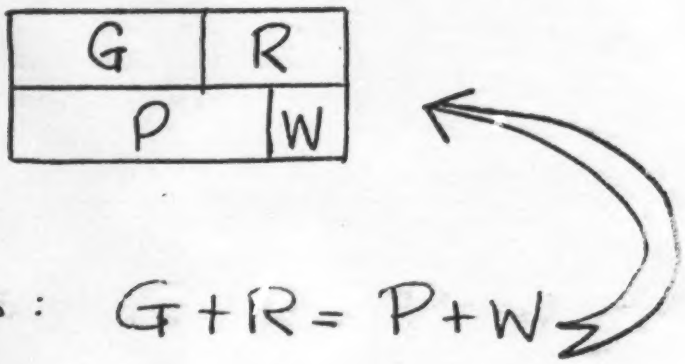


IT ALSO IS: Y−P=W

OR: Y−W=P

WRITE A DIFFERENT EQUATION FOR EACH OF THE TRAINS ABOVE

EQUATIONS can be used to compare 2 TRAINS



HERE IS: G + R = P + W

★ MAKE W + R + W = G + W

Use 2 TRAINS and fill in the box with the correct letter.

★ EXAMPLE ★

R + W + W = R + R

answer ↑

★ R + P + ☐ = K + W

★ P + G + ☐ + R = K + G

continue over ..... >

★ $P + \square = D$

★ $K + R + W = N + \square$

NOW TRY SOME EQUATIONS FINDING THE DIFFERENCE:

$P - W = \square$

$y - P = \square$

$D - y = \square$

$K - D = \square$

$G - W = \square$

$D - P = \square$

$N - K = \square$

$N - R = \square$

$\mathcal{O} - G = \square$

$\mathcal{O} - K = \square$

HARDER ONES ↓ HARDER ONES ↓ HARDER ONES

HARDER ONES ↓ HARDER ONES....

$K - \square = P$

$\square = E - K$

$D - \square = W$

$\mathcal{O} - R = \square$

$\square - W = K$

$D - R = \square$

This is Algebra? I thought Algebra was HARD??!

YOU DID IT
AREN'T YOU PROUD!